

Chapter 13

Effects of Gluten on Health: Pseudocereals as Gluten Substitutes

Ipek Bayrakci

Alanya Alaaddin Keykubat University, Turkey

Tugba Aktar

Alanya Alaaddin Keykubat University, Turkey

ABSTRACT

This chapter discusses the role of carbohydrates in nutrition, with particular emphasis on grains and their importance as a source of protein, fiber, and micronutrients. It also explores the negative effects that gluten, a storage protein found in grains, can have on some individuals, leading to disorders such as celiac disease, wheat ataxia, wheat allergy, and dermatitis herpetiformis. The primary treatment for such conditions is to remove gluten from the diet, but this can lead to a reduction in fiber intake and an increase in fat intake. The chapter then looks at the important role gluten plays in dough rheology, particularly in baking, and considers the challenges faced by those who must follow a gluten-free diet. Finally, it examines the potential of pseudocereals such as quinoa, amaranth, and buckwheat as substitutes for gluten-containing grains with their potential usage in the food industry and daily nutrition routines.

INTRODUCTION

Carbohydrates are the major source of energy for mammals and a food constituent that has a high proportion in a regular diet. Grains are the basic source of carbohydrates, and some of the significant ones are wheat, rye, oats, barley, corn, and rice. In

DOI: 10.4018/979-8-3693-0819-6.ch013

Effects of Gluten on Health

addition to their carbohydrate content, grains are considered an important source of protein and fiber and contain some micronutrients such as B vitamins, zinc, vitamin E, and magnesium. Thus, grains are important in avoiding or suspending most cardiovascular diseases and intestinal problems due to their nutrient contents.

However, in some individuals, grain consumption can cause various disorders, which are mainly attributable to a storage protein called gluten. Gluten is characterized as a mixture of various proteins, primarily gliadin and glutenin; it is found in oats (avenin), barley (hordein), wheat (gliadin), and rye (secalin) and is generally referred to as gluten. Gluten, as a storage protein, is associated with many diseases such as celiac disease, wheat ataxia, wheat allergy, and dermatitis herpetiformis. The primary treatment routine in gluten-related diseases is the entire removal of gluten from the daily diet; however, it is predicted that a gluten-free diet will increase fat intake and decrease fiber intake. Furthermore, gluten plays an important role in dough rheology, especially in bakery products. Gliadin in the content of gluten provides viscosity and extensibility to the dough, while gluten provides adhesion and elasticity to the dough (Hayit & Gül, 2017). Additionally, gluten traps carbon dioxide during the fermentation of fermented bakery products such as bread, causing the dough to rise and creating a porous structure after baking. Hence, individuals who must follow a gluten-free diet are forced to consume not only nutritionally inadequate but also less acceptable products in terms of their texture and taste. In this context, dairy products, legumes such as chickpeas, lentils, and peas, and hydrocolloid compounds such as nutritional fibers, agar, gums, alginates, and pseudocereals such as sorghum, quinoa, amaranth, and buckwheat are added to gluten-free products to enrich them and provide the technological, textural, and sensory properties of gluten protein in these products (Arendt & Dal Bello, 2011; Pellegrini & Agostoni, 2015).

Recently, pseudocereals have become more and more attractive due to their contents of essential amino acids, dietary fiber, minerals, and vitamins compared to grains. Pseudocereals, which are grain-like crops consisting of buckwheat, amaranth, and quinoa, contain high amounts of starch and can be used for grain purposes, despite being non-grains (Alvarez-Jubete et al., 2010). In this chapter, the effects of gluten on health will be examined, and how the use of pseudocereals, which have high potential as gluten substitutes, affects products in terms of texture, flavor, and nutrition will be discussed.

GLUTEN

Gluten is a storage protein found in grains, including wheat, barley, rye, and controversially, oat. Wheat has the highest gluten content, typically composed of 60-70% starch, 8-15% storage protein, 10-15% moisture, 4% ash, and 1-2% fat. Of

24 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/effects-of-gluten-on-health/337281

Related Content

Pharmacological Applications of Saffron (*Crocus sativus*): A Review

Priyanka Singh (2020). *Ethnopharmacological Investigation of Indian Spices* (pp. 85-92).

www.irma-international.org/chapter/pharmacological-applications-of-saffron-crocus-sativus/252449

French Revolution

(2023). *Dark Gastronomy in Times of Tribulation* (pp. 21-45).

www.irma-international.org/chapter/french-revolution/323090

Methodology for the Design of Traceability System in Food Assistance Supply Chains: Case Bienestarina, Colombia

Feizar Javier Rueda-Velasco, Angie Monsalve-Salamanca and Wilson Adarme-Jaimes (2021). *Research Anthology on Food Waste Reduction and Alternative Diets for Food and Nutrition Security* (pp. 440-461).

www.irma-international.org/chapter/methodology-for-the-design-of-traceability-system-in-food-assistance-supply-chains/268152

Effects of Industrial Processing Methods on Camel Milk Composition, Nutritional Value, and Health Properties

Ali Ahmed Metwalli and Yonas Hailu (2020). *Handbook of Research on Health and Environmental Benefits of Camel Products* (pp. 197-239).

www.irma-international.org/chapter/effects-of-industrial-processing-methods-on-camel-milk-composition-nutritional-value-and-health-properties/244741

Nutraceuticals for Prevention of Chemotherapy-Induced Peripheral Neuropathy

Marco Cascella, Maria Rosaria Muzio, Sabrina Bimonte and Arturo Cuomo (2018). *Nutraceuticals and Innovative Food Products for Healthy Living and Preventive Care* (pp. 236-259).

www.irma-international.org/chapter/nutraceuticals-for-prevention-of-chemotherapy-induced-peripheral-neuropathy/191460